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ABSTRACT

A study examined the use of the Penn State Adult Literacy Courseware, which teaches sight vocabulary to beginning adult readers, in a volunteer tutoring situation with three male and two female unemployed adults whose average grade level in reading was 1.1. All students were white, their average age was 37, and the highest grade any of them had completed in school was the 10th. The five tutors were all female and received 14 hours of training on the use of the courseware before giving 20 hours of tutoring. Pre- and posttest measurements were taken with the Slosson Oral Reading Test (SORT), an attitude survey of tutors and students concerning the use of computers, and two sections of the Baltimore County Design, which measured how well the students could identify words in isolation and in context. Limitations of the study include the small number of subjects (N=9) and the fact that there was no control group, so the results cannot be considered statistically significant. Analysis of the pre- and posttest results showed positive gains on all three measurement instruments. The average reading grade level had risen to 1.76 after only 20 hours of instruction, as compared with a minimum 25 hours that traditional programs take to make comparable gains. Students increased their positive attitudes about computers. Starting with less positive attitudes, the tutors also increased their positive feelings. However, no tutors indicated they would prefer the computer over any other method. (The document includes results of a tutor survey on how the courseware could better serve the needs of displaced workers and on the role of the tutor, as well as a 13-item bibliography.) (CML)

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FINAL REPORT
Use of Computer Assisted Instruction with Displaced Workers and Volunteer Tutors

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Report submited to: Pennsylvania Department of Education

Report submitted by: Brett Bixler, Project Coordinator
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The Pennsylvania State University

August, 1988

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Abstract

Technology is beginning to be used effectively with low literate adults who are enrolled in volunteer literacy programs. The role of the volunteer tutor is, as yet, uncertain. Many feel threatened by the computer; others are finding ways to help their students learn more efficiently with this additional instructional tool. Research is needed to determine the most effective roles for the volunteer tutor in using technology.

Of particular interest in this study was the use of the Penn State Adult Literacy Courseware which teaches sight vocabulary to beginning adult readers. It was used in a volunteer tutoring situation with unemployed adults who are functioning below the sixth grade reading level. Methods of adapting the courseware to meet the needs of workforce education were studied. Gains in reading level and attitude toward computers were measured among the students. Changes in attitude toward the computer as an instructional tool were measured among the tutors. Recommendations for future research, based upon the findings of this study, are detailed.

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Final Report

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Introduction

Displaced workers–especially those in manufacturing occupations–are unemployed for long periods of time and must make major occupational changes to find new employment (U.S. Congress, Office of Technology Assessment, 1986; U.S. Department of Labor, 1986). Functionally illiterate workers are not only unemployed for longer periods of time than other displaced workers, but they are also less likely to qualify for job training programs and are less likely to participate in traditional basic skills programs. Older adults are underrepresented in adult basic education (ABE) and literacy programs (Kasworm, 1982; Pennsylvania Department of Education, 1986; U.S Department of Health and Human Services, 1985). New methods of preparing this population for re-entry in the workforce must be found.

Computer-assisted instruction may be one of these methods. It has been proven effective in numerous studies (Askov, Maclay, and Bixler,1987; Askov, 1986; Askov and Brown, 1987; Maclay and Askov, 1987; Maclay, 1986; U.S. Congress, Office of Technology Assessment, 1987; Pastori, 1986; Turner, 1988). However, most of these studies have been conducted with a general population rather than targeted groups; therefore, it is very difficult to know whether a particular instructional approach, such as computer-assisted instruction, will be effective with a given group, such as unemployed workers. Another question that arises is whether an instructional

approach developed for one target group may be used effectively with a different target group.

The methodology used to prepare displaced workers for re-entry into the workforce must be examined as well. The concept of functional context for instruction (Sticht, 1987) has made an important contribution to adult reading instruction. Basic skills that are essential to performing a job or job domain are identified and then taught within the functional context of work so that the worker not only learns the basic skills that are important to performing his/her job well but also masters the content knowledge associated with his/her job. Job-related basic skills instruction has been proven to be more effective in enhancing productivity on the job than general basic skills instruction offered by commercial materials (Sticht, 1987). In this approach literacy is defined as specific activities conducted to fulfill particular functional purposes in relation to specific domains of knowledge; thus, basic skills are taught using actual language, materials, and situations that the learner encounters on the job. Instruction linking job-skill and basic-skill training could benefit displaced workers, helping them to make use of their considerable job knowledge to lessen the effort involved in learning basic skills. The question of whether the authoring capabilities of computer-assisted instruction, in which job specific skills can be used to adapt existing instruction to job-specific reading and writing tasks is an important concept that needs to be explored.

Traditional literacy instruction nearly always relies on the presence of a tutor to deliver instruction. Recently, technology is beginning to be used effectively with low literate adults who are enrolled in volunteer literacy programs. The role of the volunteer tutor is, as yet, uncertain. Many feel threatened by the computer; others are finding ways to help their students learn more efficiently with this additional instructional tool. Research is needed to determine the most effective roles for the volunteer tutor in using technology.

Description and History of the Software Used in This Study

The Pennsylvania Department of Education, Division of Federal Programs obtained permission to use state administrative funds for parent literacy in Chapter I beginning in 1983. The number of children from the same family in Chapter I compensatory education programs was of specific concern. Informal observation

indicated that not only do siblings tend to be identified for Chapter I services but also that their parents appear to lack functional literacy skills, such as writing absentee excuses for their children.

Computer-assisted instruction (CAI) courseware was developed during the 1984-86 fiscal years with funding from the Pennsylvania Department of Education, Chapter I and 310 Adult Basic Education Special Projects. This courseware uses a "whole word" approach with some word building activities in teaching 1,000 high frequency and functional words to adult beginning readers. The goal is expanded word recognition for adult non-readers. The courseware is interactive, branching and responding to the user's answers and needs. The courseware runs on an Apple IIe microcomputer with two disk drives, color monitor, printer, and a speech synthesizer (Echo GP). The courseware consists of 21 disks which deliver the instructional program and record student responses.

The courseware begins with a module on computer usage, especially designed to acquaint the student with the speech synthesizer, the commands and the letter/number keys. Reading vocabulary has been divided into two categories: picturable words (Module 2) and nonpicturable words (Module 3). These are further divided into lessons (of ten words). Picturable words are introduced with a graphic while nonpicturable words are introduced with short selections on a variety of topics. The words are taught in context using the speech synthesizer with multiple choice and completion exercises to practice recognition of the target words. Games are used to reinforce the identification of new words.

The student is pretested before each lesson with 90% set as mastery level. If mastery is not attained, the student is directed to the instruction and games to help him/her learn the target words. The student is posttested upon completion of the lesson and/or games. Five forms of each test exist. The courseware uses branching to permit review and reinforcement. An elaborate record-keeping system records and analyzes responses, number of attempts and response time. A file editor disk allows the instructor to monitor the student's progress.

Module 4 teaches 140 words commonly found on application forms of all types. The student practices this vocabulary by completing an application form with his/her own data which may be printed as a reference. Module 5 teaches 170 words which are based on high-frequency phonograms. This module gives practice in word

building with consonants being added before 16 common word patterns (such as "ake"). Module 6 (a word processing module) allows the student to use the words s/he is learning in writing activities. Of particular interest to this study are Modules 3 and 6. These Modules can be customized by the teacher to include his/her own words and sentences.

Module 3, which teaches non-picturable words in the context of short stories, permits the teacher or tutor to enter short stories that include ten target words for instruction. Teachers or tutors can focus on vocabulary of particular importance to the students being served. If the students are in a job training program or are interested in finding employment, the teacher or tutor can select vocabulary related to an occupational area for instruction. For example, if students are preparing for a training program in carpentry, a short story could be written to present the vocabulary words dealing with carpenter's tools, such as *awl*. These words become the focus of instruction in addition to the high frequency and functional vocabulary already taught in the courseware.

It is also possible to create stories that revolve around students' interests. For example, a story written for students living in a housing project might relate to procedures for filing a complaint or to safety in the project. The teacher or tutor can then select ten target words used in the story for instruction.

A specifically designed word processor, simplified for low literate adults and capable of saying what the student has written, is included in Module 6. Experience has shown that low literate adults can use the word processor if given instruction and assistance as necessary. For example, if the student has been studying "carpentry words" in Module 3, s/he can write (or dictate to the teacher or tutor) using the word processor a single sentence, such as "He hit the nail with the hammer." If s/he does not remember how to spell a word, such as *with*, s/he can check the spelling in the word bank at the top of the screen. All of the target 1,000 high frequency and functional vocabulary taught in the courseware are listed in the word bank.

Although typing skills may be slow, the student benefits from entering his/her own writing. Letter-sound correspondences are reinforced by attempting to spell words independently. The student gains experience and confidence with written composition. S/he also begin the process of becoming computer literate through using the computer for simplified word processing.

Students can also do some writing that is important to their personal lives. They can write to a distant relative or remind a son or daughter of an important task. Even grocery lists can help students expand their vocabulary. Everything that the students or teacher/tutor write can be printed. For example, a letter to a distant relative can be printed and mailed. A grocery list can be created for more efficient shopping.

It is also possible for the teacher or tutor to enter words into a special word bank. These words can be uniquely appropriate for the individual or group at a particular site. The student can thus access the particular words that s/he is studying. This capability makes it possible to tailor instruction to the needs and interests of the individual, providing a functional context for learning to read and write (Sticht, 1987).

A teacher or tutor can also use the special word bank for instruction. For example, to reinforce a particular grammar skill the teacher or tutor could enter a sentence in the word bank with a particular error, such as verb endings. The student's task would be to rewrite the sentence correctly in the word processor. The student's responses can be saved and stored until the teacher or tutor has an opportunity to look at them.

Description of Students

There were three male and two female students who completed the study. All students indicated their primary motivation for becoming involved in the study was to improve their basic skills. All were Caucasian, and the average age was 37. The average highest grade completed in high school was tenth. Students were reading at an average grade level of 1.1 at the beginning of the study.

The first male student is 43 years old, married with three children. He was unable to work during the study because of a back injury. The last grade he had completed in high school was eight. At the start of the study, he was not sure if a computer could teach him to read and write. He now knows that it can and is really enjoying himself.

The second male student is 30 years old, divorced with one child. The last grade he had completed in high school was 11. He had a great deal of trouble in school with reading and spelling. His parents had taken him to doctors to see why he

was having difficulties, but never received any definite results. His son is now in the second grade. He feels embarrassed that his son can read words that he can't. He had fun learning with the computer, and is amazed what he is now able to do. He never thought he would be able to learn to read, let alone use a computer.

The third male student is 41 years old, married with six children. He did very well using the computer. During the study, he obtained a job, but wants to continue working towards his GED.

The first female student is 55 years old. She is a widow. The last grade she completed was eight. She wanted to learn to read so her children would be proud of her. Although she was somewhat over-anxious about using the computer at first, she quickly adjusted to it, and would even talk back to it. She did not feel she could learn through using the computer, and required supplemental activities to enhance her learning.

The second female student is 25 years old, married with two children (twins). The last grade she completed in high school was 11. she has a great deal of emotional and personal problems. She liked using the computer and hearing it talk to her. She gave the instructors the impression that she enjoyed using the computer to learn to read, and also because it is a skill that her husband lacks.

During the project, three students quit for various reasons. Two students obtained employment and were no longer able to continue with the program; one student moved to a distant geographical location. Attempts were made to recruit other students during the project. These were unsuccessful, due to the rural environment and lack of people that met the research requirements.

Description of Tutors

This study began with seven tutors. One was forced to leave in the early stages of the study; another could not find a student with which to work.

The first tutor was also the project leader at the library where the study took place. She had some prior computer experience, and coordinated the efforts of the

other tutors on a daily basis. She was very interested in the project, and was extremely instrumental in ensuring its success.

The second tutor recently returned from Germany, where she spent two years in the U.S. Army. She was interested to see if there was a significant amount of difference in the amount of time it takes to learn something between a computer versus traditional methods.

The third tutor is a library volunteer. She loves to read and wanted to help those who can't. She was apprehensive about using a computer. She liked the project and the software used, but felt that written supplemental material was extremely important.

The fourth tutor is an executive secretary. She was impressed with the courseware and the speech capabilities of the computer.

The fifth tutor works at a nearby hospital as a Medical Librarian. She was very excited about the research project. At first, she was unsure about using the computer. Her student did very well before she left the study.

Goals and Objectives of the Project:

The goal of this project was to evaluate the effectiveness of computer-assisted instruction with displaced workers and volunteer tutors in a community-based, volunteer-tutor literacy program. The project was conducted in cooperation with the Mifflin County Literacy Council which is affiliated with the Mifflin County Library Association. The literacy council is an organization of volunteer tutors with a salaried coordinator. The goal of the project was accomplished through implementing the following objectives:

a). Gains in reading level made by adult students using computer-assisted instruction in a local literacy program were measured.

b). Attitudes of adult students toward the use of computer-assisted instruction in literacy programs were measured.

c). Attitudes of volunteer tutors toward the use of computer-assisted instruction in literacy programs were measured.

d). Methods of adapting existing software/courseware to meet the needs of the workplace were evaluated.

e). The role of the tutor when utilizing computer-assisted instruction as an instructional delivery system was examined.

The objectives for this project are discussed below. Prior to working with the students, the tutors received a training session on how to use the computer. This session was eight hours in length, and covered all the information they needed to know in order to use the Courseware. Follow-up sessions occurred on two separate occasions. The first was for review, and was three hours in length. The second was to learn new material on the authoring component of the Courseware, and was also three hours in length. The total length of time the tutors were formally involved in training was 14 hours.

Objective 1: Measurement of gains in reading level made by adult students involved in the project

By a variety of methods, unemployed adults were invited to participate in the program. It was very difficult to find a large number of people that were both displaced workers and low-literate (0-4 reading level). Of those contacted, 12 were eventually tested for reading level/skill. Of these, 9 qualified for the project. These people were pretested to determine reading level at the start of the project, and posttested at the end of the project. This testing involved the Slosson Oral Reading Test (SORT), an attitude survey concerning uses of computers, and two sections of the Baltimore County Design (BCD). The SORT is a paper and pencil test designed to quickly identify a student's reading level (grade). The teacher presents a list of words to the student and asks the students to identify as many of the words on the list as possible. Each list corresponds to a reading grade level. The first list starts at a primer level. Each subsequent list then moves up one grade level. Testing stops when the student is having difficulty identifying words on a particular list. Results of the SORT are

detailed below in Table 1. The two sections of the BCD used, subtests E-2 and E-3, are designed to measure how well the student can identify words in isolation and in context, respectively. Results of the BCD are shown in Tables 2 and 3. Attitudes of students and tutors toward computers were measured by a scale devised by Eunice N. Askov and Emory J. Brown. This scale has previously been used in a number of settings. There are eighteen items in the scale. For each item, four discrete categories were used: *Yes* , *Maybe Yes* , *Maybe No* and *No*. Responses were quantified by giving weights of 4, 3, 2, and 1 for each item so that the maximum score possible was 72. The results for this scale are shown in Table 4 (students). After testing for reading skills/level, the students were then able to use the Courseware. They first used Module 1 which introduced them to the formats, activities, and the voice used throughout the courseware. They were then either allowed to choose a lesson or were assigned to a lesson by the tutor. Due to the limiting time factor of 4 1/2 months for the project, Modules 2 and 5 were not used in this investigation. Study was concentrated on Modules 3, 4, and 6. The tutors were encouraged to supplement the instructional time with additional activities. Extensive records of student responses and response time were kept on the student data disks. Tutors were instructed to posttest the students after twenty hours of instructional time. The posttesting used the same instruments as in the pretesting phase.

A standard analysis of variance (ANOVA) was used to analyze the pre/posttest results. Due to the small number of subjects involved, and the fact that no control group was involved, these results cannot be considered statistically significant. These scores are shown in Tables 1-3 below:

Table 1

Results of the SORT

	Pretest			Posttest		
	N	M	SD	N	M	SD
Exp. Group	5	1.1	3.31	5	1.76	1.11

Table 2

Results of the BCD-E2
(Words in Isolation)

	Pretest			Posttest		
	N	M	SD	N	M	SD
Exp. Group	5	11.4	6.24	5	14.8	1.32

Table 3

Results of the BCD-E3
(Words in a Functional Setting)

	Pretest			Posttest		
	N	M	SD	N	M	SD
Exp. Group	5	18.2	8.42	5	21.6	11.64

Positive gains were shown in all three instruments. Students were reading at an average grade level of 1.76 at the end of the study. The experimental group had gained more than half of one year in reading level in only 20 hours of instructional time; traditional programs usually take a minimum of 25 hours to make comparable gains. These results are consistent when compared to similar studies (Askov, Maclay, & Bixler, 1986; Askov, Maclay, & Bixler, 1987).

Objective 2: Measurement of changes in attitudes towards computer use made by adult students involved in the project

Attitudes of students toward computers were measured by the same scale used for the students. This scale was administered to the students prior to instructional use of the computers as a pretest, and to the same students after 20 hours of computer instruction as a posttest. The instrument was administered by the tutors in a one-on-one situation where the items were read by tutors and the students marked appropriate responses. These scores are shown in Table 4:

Table 4

Results of the Attitude Scale (Students)						
	Pretest			Posttest		
	N	M	SD	N	M	SD
Exp. Group	5	60.4	32.77	5	63.6	34.92

A positive increase in attitude towards computers by the students was noted in this study. It is interesting to note that the students had a very positive attitude towards computers to begin with. The results of this posttest indicate that the students felt the computer was an important tool that would help them in their learning endeavors. They also felt little or no anxiety towards using the computer at the study's conclusion. The test also revealed that they would enjoy further instruction via the computer, although it was unclear if they preferred a computer over a tutor for instruction.

Objective 3: Measurement of changes in attitudes towards computer use made by tutors involved in the project

This study began with seven tutors. One was forced to leave in the early stages of the study for personal reasons; another could not find a student with which to work.

The same attitude scale used for the students was used for the tutors. These scores are shown in Table 5:

Table 5

Results of the Attitude Scale (Tutors)						
	Pretest			Posttest		
	N	M	SD	N	M	SD
Exp. Group	5	58.8	32.51	5	61.2	34.14

The tutors showed slight positive gains in attitudes towards computers. None of the tutors indicated that they would prefer to use a computer over any other method, although they all indicated a strong belief in the importance of computers and their use in reading and writing instruction.

Objective 4: Evaluation of methods of adapting the existing software to meet the needs of the workplace

The Penn State Adult Literacy Courseware has an authoring capability that allows the tutor to create lessons which directly fit the needs of the students. The format of the lesson remains the same as the lessons supplied with the Courseware; only the lesson content changes. Tutors were trained in the authoring capabilities of the Courseware several weeks after the project started. This gave the tutors time to become familiar with the Courseware and their student's needs. The tutors constructed lessons using content derived from analysis of local employers and local geographical locations. These lessons were then used by the students. This method of adaptation worked very well, according to the tutors. Students were able to relate to the functional context of the words they were learning. The tutors saw greater worth in these lessons because of the functional context, and also had the added benefit of being part of the creative process. This would not have been possible without the capabilities of the authoring system.

Tutors were also encouraged to devise a series of supplemental activities to be used in conjunction with the Courseware. Most these activities involved one-on-one interaction with the students, or were for the student to work on at home. While the tutors enjoyed the creativeness of this idea, most felt they would prefer to use pre-existing supplemental materials.

Objective 5: Examination of the role of the tutor when utilizing computer-assisted instruction as an instructional delivery system

A questionnaire was administered to the tutors at the completion of the study. It was designed to gather facts and opinions on how the Courseware could better serve the needs of this population, and the role of the tutor in using it. The questions and the responses to these questions are listed below:

What did you like most about this project?
Working with the computer, creating lessons, the independence for the learner, improved self-esteem for the learner, and ease of use for the students.

What did you like least about this project?
Lack of tutor/student involvement.
Directions were repeated too much.
Lack of supplementary material.
Computer was slow.

What did you like most about the training sessions?
Meeting with other tutors, discussing ideas.

What did you like least about the training sessions?
Sessions were too short.
More sessions were needed.
Too much material at one time.

Was there enough training?
No.

Could training be made better? How?
Start with the basics. Each training session should concentrate on one aspect, have a slow pace, and provide for more hands-on training. The instructor needs to show how the materials being used apply to each tutor's sessions (functional context).

Would a general "Introduction to Computers" session be helpful for tutors, or should they learn a specific software package and generalize from it?
The tutors had mixed reactions: some felt an "Intro" package would be useful, others felt using a specific package and generalizing basic computer skills was better.

Is the computer a useful tool for this type of instruction? Why?
Yes, it boosts the student's egos, gives them a chance to write, and provides reinforcements on basic skills

Is the authoring component in the Courseware desirable? Why?
Yes. It allows for creativity on the part of the tutor. It allows for personalization. The tutor can individualize the software for the needs of a particular student.

Did you enjoy working with the authoring component? Why?
Yes. Tutors enjoyed creating lessons, and "being a part of" the software. Adult learners have special needs and interests that should be met to keep the student focused on goals. They also enjoyed seeing their efforts become part of the software package. By becoming so closely involved with the lessons, it was easier to spot weak points and provide needed remediation.

Is software adaptability important? Why?
Yes. Each student is unique.. Tutors can adapt lessons as necessary.
It is important to have different levels of difficulty for each student.
It also allows for variety.

How important is word processing? Why?
Word processing is a skill that all will need in the future. It can be used as a means of communication and storage of ideas.

How much tutor-student interaction is needed for this type of instruction?
Initially a great deal. As the student progresses, less interaction is needed.

Define the role of the tutor in using software with students.
As a support person who is always available to provide guidance.

How can tutors achieve more interaction with students in this type of setting?
By taking time at the beginning and end of each lesson to talk with the student about his/her progress, growth, needs, and obtaining goals. Supplementary materials such as flash cards can be used in conjunction with this instruction.

Define the program coordinator's role in this type of teaching situation.
That person presents the program to tutors, provides inservice training, inspires them, and needs to possess the ability to answer technical questions.

Could this type of instruction (computer-assisted) succeed without the supervision of at least one person who is familiar with computers?
No. At least one person with a firm working knowledge of hardware and software is needed.

How much will the training you received for this software enable you to use other software?
Because this software is so complex, other simpler programs will be easier to implement. It also enabled the tutors to feel comfortable with the computer.

Will this software help the students when they re-enter the workforce?
Yes. Not only will their basic skills have improved, they will also have some computer experience.

What other areas does the courseware need to address to enable these students to re-enter the workforce?
More word processing exercises, data base experiences.

How important was the speech quality of the Courseware?
Very important. Current level is barely acceptable. Improvement in this area needs to be made.

How important are supplementary materials (paper & pencil) for computer assisted instruction?
Extremely important. They enhance retention and transfer, and also point out individual weaknesses that the computer cannot ascertain.

Is computer-assisted instruction used best as stand-alone or supplemental material?
As supplemental material.

Did the students learn any computer-literacy skills during the course of their instruction?
Yes. Keyboarding skills, using disks, etc. were all learned as they used the computer. Students quickly became adept at using the hardware and software.

Conclusions

Consider this statement made by one of the tutors in this project:

"The computer is a tool that will become part of our lives."

The use of computers in the workplace is becoming more common. Low-literate displaced workers, in addition to having a need for basic skills training, also need to know computer basics to be competitive. The concept of teaching skills in a functional context, where the student can easily see the relevance of what is being learned to his/her needs, is particularly powerful with this population. By using the computer to teach basic skills, the student is also learning computer skills as well. The students in this project reacted in a very positive manner towards the computer. They viewed it as a non-threatening medium through which they could improve their skills. As individuals attempting to mainstream into society, they see the computer as a device which is quickly becoming the status quo, and desire to be a part of it. What they are using the computer for is not nearly as important as the fact that they are simply using it. In addition, the perception that they are able to successfully use a computer serves as a confidence booster, and enables them to pursue goals that they formerly perceived as unobtainable.

The students in this study showed greater learning increases in a given period of time as compared to "traditional" methods. This phenomena has been replicated in other studies (Askov, E.N. (1986); Askov, E. N., Maclay, C. M., & Bixler, B. (1987)). Comparisons of this nature need to be implemented as longitudinal studies over several years to ascertain if this is a temporary trend, or is indeed a more efficient way for this population to learn.

The role of the volunteer in Computer-Assisted Instruction is unclear in the literature and in the eyes of the volunteer. Most volunteer tutors want to work with students in a direct, one-on-one manner. Existing software packages most often use the tutor as a "disk administrator", and do not explore how the volunteer tutor can fully participate in a system that was designed for two-way (computer to student) instruction. This issue can be addressed in two ways. First, future software developed for the low-literate adult must include the tutor as an integral part of the learning process. Some

software for adults, such as LEAP-1©, has tackled this approach with success. Customized software, where the tutor can create his/her own lessons on the computer, is also a way to involve the tutor in the learning process. Practitioners in the field, beginning to recognize the importance of involving the tutor in the creative aspects of teaching, are developing new products that directly address this issue. Second, existing software needs to be examined, modified and/or have supplemental (non-computer) materials added. This will enable the tutor to interact with the student through the computer. The computer then becomes a tool for the tutor as well as a tutor itself.

The software used in this study, the Penn State Adult Literacy Courseware, has proven to be adaptable to the needs of displaced workers. The tutors felt that the ability to author content-specific lessons for their students was an essential part of its success. They felt the creativeness they experienced through developing lessons was important and desirable. They expressed a desire to have more interaction with their students during the CAI lessons

Most volunteer tutors receive between 10-12 hours of formal instruction on the basics of reading and how to work with students. Most adult literacy educators would argue that this is not nearly enough time to adequately train them. The learning curve for using computers is steep. In this project, the volunteer tutors were trained for a total of 14 hours. More time was spent on computer training than the "reading basics", yet all the tutors felt they needed more computer training. A real training dilemma exists for volunteer tutors if they are to effectively utilize the computer for instruction.

This problem needs to be addressed immediately. As computer technology becomes increasingly affordable, greater numbers of organizations involved in literacy instruction will acquire at least one computer. Tutors will be in a position where they must obtain the skills needed to use them. In this study, all the tutors indicated the need for extensive training, and also constant access to an individual with knowledge of computers. Ideally, a concise computer training program needs to be devised for volunteer tutors and literacy organizations in general. Such a program should be available nation-wide. A network of "computer-literate" organizations, that would serve as consultants to literacy programs, also needs to be established.

Literacy organizations also need to know how to best integrate computers into existing curriculum. No true schema exists for doing so in an organized manner.

Such integration should be based on sound educational research on CAI with adults and examination of existing curriculum. Existing software packages that have proven useful for low-literate adults need to be evaluated to determine what their educational objectives are. Once this is determined, the literacy organization's curriculum must be examined to show where a particular piece of software will be the most useful in that curriculum.

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